

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BEFORE THE BOARD OF PATENT  
APPEALS AND INTERFERENCES

Appellant: Thomas W. Stone	)	
	)	
	)	Group: 2613
Serial No.: 10/700,828	)	
	)	Examiner: Agustin Bello
Filed: November 4, 2003	)	
	)	
Title: WAVELENGTH SELECTIVE	)	
SWITCHING AND/OR	)	Confirmation No. 6251
ROUTING SYSTEM	)	

**APPEAL BRIEF**

Mail Stop Appeal Brief - Patents  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Dear Sir:

This Appeal Brief is submitted in response to the final rejection of the claims mailed April 18, 2007. A Notice of Appeal was filed on July 12, 2007.

This brief contains items under the following headings as required by 37 CFR §41.37 and MPEP §1206:

- (1) Real Party In Interest
- (2) Related Appeals and Interferences
- (3) Status of Claims
- (4) Status of Amendments
- (5) Summary of Claimed Subject Matter
- (6) Grounds of Rejection to be Reviewed on Appeal
- (7) Argument
- (8) Claims Appendix
- (9) Evidence Appendix
- (10) Related Proceedings and Interferences Appendix

**(1) REAL PARTY IN INTEREST**

The real party in interest in the above-referenced patent application is Avago Technologies Fiber IP (Singapore) Pte. Ltd., having an address at No. 1 Yishun Avenue 7, Singapore 768923.

**(2) RELATED APPEALS AND INTERFERENCES**

There are no related appeals or interferences currently known to appellant, Appellant's legal representatives or the assignee, which will directly affect, or be directly affected by, or have a bearing on, the Board's decision.

**(3) STATUS OF CLAIMS**

Claims 1-21 were filed with the application. Claims 1-18 are currently pending in the application. Claims 19-21 are allowed. Claims 6 and 18 are canceled. The rejection of claims 1-5, and 7-17 is appealed.

**(4) STATUS OF AMENDMENTS**

No amendments were filed or entered subsequently to the Final Office Action mailed April 18, 2007.

**(5) SUMMARY OF THE CLAIMED SUBJECT MATTER**

Appellant's invention as independently claimed is summarized and explained below with reference numerals, specification page numbers and drawing figure numbers indicating where the claim finds support in the specification and drawings.

1. A method for optically switching/routing comprising the steps of (1) separating input optical radiation (25) into distinct input channels (35-45) [Figure 1a; page 10, lines 4-6], (2) selecting desired distinct output channels (55-65) [Figure 1a; page 10, lines 16-18], (3) propagating said distinct input channels (35-45) through a selectable grating based switching/routing sub-system (50), the selectable grating based switching/routing sub-system (50) comprising at least one pixellated switchable component, in order to direct said distinct input channels (35-45) to desired distinct output channels (55-65) [Figure 1a; page 10, lines 5-20], and, (4) recombining said desired distinct output channels (55-65) [Figure 1a; page 10, lines 16-18].

5. An optical switching/routing system comprising an optical separating sub-system (15) [Figure 1a; page 9, lines 22-23]. The optical separating sub-system is capable of separating input optical radiation (25) from at least one input beam/port (20) into distinct input channels (35-45) [Figure 1a; page 9, lines 22-34 and page 10, lines 3-6]. The optical switching/routing system also comprises an optical recombining sub-system (75) [Figure 1a; page 9, lines 23-25]. The optical switching/routing system also comprises a selectable free space grating based switching/routing sub-system (50), the selectable switching and routing sub-system (50) being interposed optically between the optical separating sub-system (15) and said optical recombining sub-system (75) [Figure 1a; page 9, lines 22-26 and page 12, lines 21-26]. The selectable switching and routing sub-system (50) also comprises at least one pixellated switchable component [Figure 1a; page 9, lines 22-26 and page 12, lines 21-26]. The selectable switching/routing sub-system (50) is capable of switching/routing the distinct input channels (35-45) to desired distinct output channels (55-65) [Figure 1a; page 10, lines 6-18 and page 12, lines 21-26]. The optical recombining subsystem (75) is capable of redirecting and recombining said desired distinct output channels (55-65) for output into at least one output beam/port (80-95) [Figure 1a; page 9, lines 22-26, page 10, lines 20-24 and page 12, lines 21-26].

19. An optical switching/routing sub-system (500) comprising a first diffractive grating means for receiving and directing each of a plurality of input beams (512) of electromagnetic radiation to travel in free space along a predetermined path of a plurality of separate paths to a predetermined output location of a plurality of output locations (516) [Figure 6a; page 22, lines 9-12]. The optical switching/routing sub-system also comprises a second diffractive grating means. The first diffractive grating means comprises a plurality of substantially evenly spaced apart switchable transmissive diffractive gratings (524) and each of said spaced apart switchable transmissive diffractive gratings (524) having at least one separately switchable region (526) [Figure 6a; page 22, lines 9-27 and page 23, lines 1-4]. The least one said separately switchable region (526) of said switchable diffractive gratings (524) is capable of being selectively activated or deactivated in order to independently control which said predetermined path of said plurality of separate paths at least one of said plurality of input beams (512) of electromagnetic radiation travels in free space [Figure 6a; page 22, lines 9-27 and page 23, lines 1-4]. The second diffractive grating means receives a plurality of output beams (516) from said plurality of output locations and redirects the output beams (516), such that said plurality of redirected

output beams (516) are substantially parallel and substantially coplanar to said plurality of input beams (512) [Figure 6a; page 22, lines 9-27 and page 23, lines 1-4]. The first diffractive grating means and said second diffractive grating means constitute a planar switch.

Serial No. 10/700,828  
Thomas W. Stone  
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**(6) GROUNDS OF REJECTION TO BE REVIEWED ON  
APPEAL**

- A. Claims 1-5 and 7-17 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Doerr (U.S. Patent No. 6,956,987) in view of Volodin (U.S. Patent No. 7,031,573).



## **(7) ARGUMENT**

Claims 1-5 and 7-17 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Doerr et al. (U.S. Patent No. 6,956,987) in view of Volodin et al. (U.S. Patent No. 7,031,573). Appellant respectfully asserts, for at least the reasons advanced below, that claims 1-5 and 7-17 are not unpatentable over Doerr et al. in view of Volodin et al.

### **Claim 1**

Claim 1 recites the following:

A method for optically switching/routing comprising the steps of:

- separating input optical radiation into distinct input channels;

- selecting desired distinct output channels;

- propagating said distinct input channels through a selectable grating based switching/routing sub-system, the selectable grating based switching/routing sub-system comprising

at least one pixellated switchable component, in order to direct said distinct input channels to desired distinct output channels; recombining said desired distinct output channels.

The Examiner states the following on pages 2 and 3 of the final rejection regarding the instant rejection:

Doerr differs from the claimed invention in that Doerr fails to specifically teach that the selectable switching/routing sub-system is grating based.

The Examiner, thus, admits that the primary reference, Doerr et al., fails to disclose or suggest "a selectable grating based switching/routing sub-system" as recited in Appellant's claim 1. The Examiner, however, takes the position, that it would be obvious, in view of the teaching in Volodin to provide a selectable grating based switching/routing sub-system.

Appellant respectfully asserts, for reasons advanced below, that the Examiner's rejection is improper and a prima facie case of obviousness has not been established.

**I. Legal Requirements for a *Prima Facie* Case of Obviousness**

MPEP Section 706.02(j) sets forth the following regarding the establishment of a *prima facie* case of obviousness:

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure.

The MPEP, thus, generally sets forth three requirements for establishing a *prima facie* case of obviousness:

1. there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings;

2. there must be a reasonable expectation of success; and
3. the prior art reference (or references when combined) must teach or suggest all the claim limitations;

In addition, the teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on Appellant's disclosure.

## **II. A *Prima Facie* Case of Obviousness has not been Established**

Appellant respectfully asserts that a *prima facie* case has not been established because there is no suggestion or motivation to combine the reference teachings as proposed by the Examiner. In the final rejection, the Examiner suggests that all of the elements of Appellant's claim 1 can be found in the prior art references. This, however, is *not* the proper test for obviousness.

"It is insufficient to establish obviousness that the separate elements of the invention existed in the prior art, absent some teaching or suggestion, in the prior art, to combine the elements."

*Arkie Lures, Inc. v. Gene Larew Tackle, Inc.*, 119 F.3d 953, 957, 43 USPQ2d 1294, 1297 (Fed. Cir. 1997).

The Examiner has provided no basis for a teaching or suggestion in the prior art for combining elements as proposed in the final rejection. The Examiner's argument regarding obviousness is as follows:

One skilled in the art would have been motivated to employ a selectable grating based switching/routing subsystem as taught by Volodin *since such switches have been found to provide optical transparency for a wide range of wavelengths, provide excellent longevity, outstanding thermal stability, good dynamic range, excellent optical quality, low cost, a variety of shapes, and refractive index isotropy.*

(final rejection, page 3, emphasis added)

The language italicized above represents the Examiner's only explanation regarding a teaching or suggestion to combine. This sentence, however, is simply an *unsupported statement* made by the Examiner. In order to establish a *prima facie* case, a teaching or suggestion to combine must be found *in the prior art*. See, e.g., *Arkie Lures, Inc. v. Gene Larew Tackle, Inc.*, *supra*. The Examiner has not referred to any prior art in support of his position that a motivation or suggestion to combine exists but, instead, apparently expects his unsupported conclusory statement to suffice. Such an unsupported statement, however, cannot constitute the evidence required to establish existence of a motivation or suggestion to combine:

Whether the Board relies on an express or an implicit showing [of a motivation, suggestion or teaching to modify the teachings of a reference], it must provide particular findings related thereto.... Broad conclusory statements standing alone are not "evidence".

*In re Kotzab*, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000)  
(citing *In re Dembiczak*, 50 USPQ2d 1614, 1617 (Fed. Cir. 1999))

Accordingly, the Examiner's statement does not constitute a showing of a teaching or suggestion to combine. At the very least, an examiner must prove that some motivation or suggestion to combine can be found in knowledge generally available to one of ordinary skill in the art (see, MPEP 706.02(j) reproduced above). In the present case, however, the Examiner provides no evidence that the requisite knowledge is generally available but, instead, attempts to rely on his own personal opinion. Such personal opinion does not represent an adequate substitute for evidence.

In short, it appears that the Examiner's proposed combination of Doerr et al. and Volodin et al. is based solely on hindsight derived from Appellant's specification. The use of hindsight in this manner is clearly prohibited by the relevant case law:

Obviousness can not be established by hindsight combination to produce the claimed invention. *In re Gorman*, 933 F.2d 982, 986, 18 USPQ2d 1885, 1888 (Fed. Cir. 1991). As discussed in *Interconnect Planning Corp. v. Feil*, 774 F.2d 1132, 1143, 227 USPQ 543, 551 (Fed. Cir. 1985), it is the prior art itself, and not the applicant's achievement, that must establish the obviousness of the combination.

*In re Dance*, 48 USPQ2d 1635, 1637 (Fed. Cir. 1998)

Obviousness may not be established using hindsight. See *W.L. Gore & Assocs., Inc. v. Garlock, Inc.*, 721 F.2d 1540, 1551, 220 USPQ 303, 312-13 (Fed. Cir. 1983).

*Kahn v. General Motors Corp.*, 45 USPQ2d 1608, 1613 (Fed. Cir. 1998)

For at least the reasons advanced above, Appellant respectfully asserts that the rejection of claim 1 is improper and should be reversed.



**Claim 2**

Claim 2 recites the following:

The method of claim 1 wherein the step of separating input optical radiation comprises the step of utilizing a separating sub-system comprising a pair of separating gratings; and,

wherein the step of recombining said desired distinct output channels comprises the step of utilizing a recombining sub-system comprising a pair of recombining gratings.

Claim 2 is dependent on Claim 1 and therefore includes all limitations of Claim 1.

For at least the reasons advanced for claim 1, Appellant respectfully asserts that the rejection of claim 2 is improper and should be reversed.

Claim 2 is allowable at least as depending from allowable base claim 1. For purposes of this appeal, claim 2 stands or falls with claim 1.

**Claim 3**

Claim 3 recites the following:

The method of claim 1 wherein the step of separating input optical radiation comprises the step of utilizing a separating sub-system comprising at least one Array Waveguide Grating (AWG); and,

wherein the step of recombining said desired distinct output channels comprises the step of utilizing a recombining sub-system comprising at least one Array Waveguide Grating.

Claim 3 is dependent on Claim 1 and therefore includes all limitations of Claim 1.

For at least the reasons advanced for claim 1, Appellant respectfully asserts that the rejection of claim 3 is improper and should be reversed.

Claim 3 is allowable at least as depending from allowable base claim 1. For purposes of this appeal, claim 3 stands or falls with claim 1.

#### **Claim 4**

Claim 4 recites the following:

The method of claim 1 wherein the grating based switching/routing sub-system comprises a volume holographic grating based switching/routing sub-system.

Claim 4 is dependent on Claim 1 and therefore includes all limitations of Claim 1.

Claim 4 is allowable at least as depending from allowable base claim 1. Claim 4 is allowable on further independent grounds for the reasons advanced below.

Appellant respectfully asserts that the Examiner has failed to establish a *prima facie* case of obviousness because there is no suggestion to combine the reference teachings as proposed by the Examiner.

The Examiner has provided no basis for a teaching or suggestion in the prior art for combining elements as proposed in the rejection. For at least the above reason, Appellant requests reconsideration and withdrawal of the rejection of claim 4 under 35 U.S.C. § 103(a).

For the reasons above, appellant respectfully asserts that the rejection of claim 4 is improper and should be reversed.

**Claim 5**

Claim 5 recites the following:

An optical switching/routing system comprising:

an optical separating sub-system;

said optical separating sub-system being capable of separating input optical radiation from at least one input beam/port into distinct input channels;

an optical recombining sub-system;

a selectable free space grating based switching/routing sub-system, said selectable switching and routing sub-system being interposed optically between said optical separating sub-system and said optical recombining sub-system; said selectable switching and routing sub-system comprising at least one pixellated switchable component; and;

said selectable switching/routing sub-system being capable of switching/routing said distinct input channels to desired distinct output channels;

said optical recombining subsystem being capable of redirecting and recombining said desired distinct output channels for output into at least one output beam/port.

Appellant respectfully asserts that a *prima facie* case has not been established because there is no suggestion or motivation to combine the reference teachings as proposed by the Examiner. In the final rejection, the Examiner suggests that all of the elements of Appellant's claim 5 can be found in the prior art references. This, however, is *not* the proper test for obviousness.

"It is insufficient to establish obviousness that the separate elements of the invention existed in the prior art, absent some teaching or suggestion, in the prior art, to combine the elements."

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(final rejection, page 2, emphasis added)

The language italicized above represents the Examiner's only explanation regarding a teaching or suggestion to combine. This sentence, however, is simply an *unsupported statement* made by the Examiner. In order to establish a *prima facie* case, a teaching or suggestion to combine must be found *in the prior art*. See, e.g., *Arkie Lures, Inc. v. Gene Larew Tackle, Inc.*, *supra*. The Examiner has not referred to any prior art in support of his position that a motivation or suggestion to combine exists but, instead, apparently expects his unsupported conclusory statement to suffice. Such an unsupported statement, however, cannot

constitute the evidence required to establish existence of a motivation or suggestion to combine:

Whether the Board relies on an express or an implicit showing [of a motivation, suggestion or teaching to modify the teachings of a reference], it must provide particular findings related thereto.... Broad conclusory statements standing alone are not "evidence".

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Accordingly, the Examiner's statement does not constitute a showing of a teaching or suggestion to combine. At the very least, an examiner must prove that some motivation or suggestion to combine can be found in knowledge generally available to one of ordinary skill in the art (see, MPEP 706.02(j) reproduced above). In the present case, however, the Examiner provides no evidence that the requisite knowledge is generally available but, instead, attempts to rely on his own personal opinion. Such personal opinion does not represent an adequate substitute for evidence.

In short, it appears that the Examiner's proposed combination of Doerr et al. and Volodin et al. is based solely on

hindsight derived from Appellant's specification. The use of hindsight in this manner is clearly prohibited by the relevant case law:

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*in re Dance*, 48 USPQ2d 1635, 1637 (Fed. Cir. 1998)

Obviousness may not be established using hindsight. See *W.L. Gore & Assocs., Inc. v. Garlock, Inc.*, 721 F.2d 1540, 1551, 220 USPQ 303, 312-13 (Fed. Cir. 1983).

*Kahn v. General Motors Corp.*, 45 USPQ2d 1608, 1613 (Fed. Cir. 1998)

For at least the reasons advanced above, Appellant respectfully asserts that the rejection of claim 5 is improper and should be reversed.



**Claim 7**

Claim 7 recites the following:

The optical system of claim 5 wherein said optical separating sub-system

comprises a first separating diffraction grating, and a second separating diffraction grating; and,

wherein said optical recombining sub-system comprises a first recombining diffraction grating, and a second recombining diffraction grating.

Claim 7 is dependent on Claim 5 and therefore includes all limitations of Claim 5.

Claim 7 is allowable at least as depending from allowable base claim 5. For purposes of this appeal, claim 7 stands or falls with claim 5.

**Claim 8**

Claim 8 recites the following:

The optical system of claim 7 wherein at least one of said first separating diffraction grating, said second separating diffraction grating, said first recombining diffraction grating, and

said second recombining diffraction grating comprises a fixed grating.

Claim 8 is dependent on Claim 5 and therefore includes all limitations of Claim 5.

Claim 8 is allowable at least as depending from allowable base claim 5. For purposes of this appeal, claim 8 stands or falls with claim 5.

### **Claim 11**

Claim 11 recites the following:

The optical system of claim 5 wherein said selectable switching/routing sub-system comprises a switchable grating based sub-system.

Claim 11 is dependent on Claim 5 and therefore includes all limitations of Claim 5.

Claim 11 is allowable at least as depending from allowable base claim 5. For purposes of this appeal, claim 11 stands or falls with claim 5.

**Claim 14**

Claim 14 recites the following:

The optical system of claim 11 wherein said selectable switching and routing sub-system comprises a planar switchable mirror based sub-system.

Claim 14 is dependent on Claim 5 and therefore includes all limitations of Claim 5.

Claim 14 is allowable at least as depending from allowable base claim 5. For purposes of this appeal, claim 14 stands or falls with claim 5.

**Claim 13**

Claim 13 recites the following:

The optical system of claim 5 wherein said selectable switching and routing sub-system comprises a switchable mirror based sub-system.

Claim 13 is dependent on Claim 5 and therefore includes all limitations of Claim 5.

Claim 13 is allowable at least as depending from allowable base claim 5. For purposes of this appeal, claim 13 stands or falls with claim 5.

### **Claim 15**

Claim 15 recites the following:

The optical system of claim 5 wherein said optical separating sub-system comprises an Array Waveguide Grating (AWG); and, wherein the optical recombining sub-system comprises an Array Waveguide Grating.

Claim 15 is dependent on Claim 5 and therefore includes all limitations of Claim 5.

Claim 15 is allowable at least as depending from allowable base claim 5. For purposes of this appeal, claim 15 stands or falls with claim 5.

**Claim 9**

Claim 9 recites the following:

The optical system of claim 7 wherein at least one of said first separating diffraction grating, said second separating diffraction grating, said first recombining diffraction grating, and said second recombining diffraction grating comprises a volume holographic grating.

Claim 9 is dependent on Claim 5 and therefore includes all limitations of Claim 5.

Claim 9 is allowable at least as depending from allowable base claim 5. Claim 9 is allowable on further independent grounds for the reasons advanced below.

Appellant respectfully asserts that the Examiner has failed to establish a *prima facie* case of obviousness because, among other reasons, there is no suggestion or motivation to combine the reference teachings as proposed by the Examiner.

The Examiner has provided no basis for a teaching or suggestion in the prior art for combining elements as proposed in

the rejection. The Examiner's argument regarding obviousness is as follows:

*One skilled in the art would have been motivated to employ volume holographic gratings as the combining and separating gratings of the system...* Therefore, it would have been obvious to one skilled in the art at the time the invention was made to employ volume holographic gratings as combining and separating gratings in the system of the combination of references.

(Office action, page 4)

The single sentence italicized above represents the Examiner's only explanation regarding a teaching or suggestion to combine. This sentence, however, is simply an *unsupported statement* made by the Examiner.

For at least the above reasons, Appellant requests reconsideration and withdrawal of the rejection of claim 9 under 35 U.S.C. § 103(a).

**Claim 12**

Claim 12 recites the following:

The optical system of claim 9 wherein said switchable grating based sub-system comprises a planar switchable grating based sub-system.

Claim 12 is dependent on Claim 5 and therefore includes all limitations of Claim 5.

Claim 12 is allowable at least as depending from allowable base claim 5. For purposes of this appeal, claim 12 stands or falls with claim 5.

**Claim 10**

Claim 10 recites the following:

The optical system of claim 7 wherein said first separating diffraction grating is substantially parallel to said second separating diffraction grating, and, said first recombining diffraction grating is substantially parallel to said second recombining diffraction grating.

Claim 10 is dependent on Claim 5 and therefore includes all limitations of Claim 5.

Claim 10 is allowable at least as depending from allowable base claim 5. For purposes of this appeal, claim 10 stands or falls with claim 5.

#### **Claim 16**

Claim 16 recites the following:

The optical system of claim 13 further comprising at least one microlens array.

Claim 16 is dependent on Claim 5 and therefore includes all limitations of Claim 5.

Claim 16 is allowable at least as depending from allowable base claim 5. For purposes of this appeal, claim 10 stands or falls with claim 5.



### **Claim 17**

Claim 17 recites the following:

The optical system of claim 13 further comprising anamorphic optics for circularizing the waveguide outputs of the separating AWG.

Claim 17 is dependent on Claim 5 and therefore includes all limitations of Claim 5.

Claim 17 is allowable at least as depending from allowable base claim 5. Claim 17 is allowable on further independent grounds for the reasons advanced below.

Appellant respectfully asserts that the Examiner has failed to establish a *prima facie* case of obviousness because, among other reasons, there is no suggestion or motivation to combine the reference teachings as proposed by the Examiner.

The Examiner has provided no basis for a teaching or suggestion in the prior art for combining elements as proposed in the rejection. The Examiner's argument regarding obviousness is as follows:

...the combination of Doerr and Volodin teaches anamorphic optics for circularizing the waveguide outputs of the separating AWG ...

(Office action, page 5)

The single sentence above represents the Examiner's only explanation regarding a teaching or suggestion to combine. This sentence, however, is simply an *unsupported statement* made by the Examiner.

For at least the above reasons, Appellant requests reconsideration and withdrawal of the rejection of claim 17 under 35 U.S.C. § 103(a).

Serial No. 10/700,828  
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Respectfully submitted,  
KLAAS, LAW, O'MEARA & MALKIN, P.C.

September 12, 2007

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## **(8) CLAIMS APPENDIX**

1. A method for optically switching/routing comprising the steps of:

separating input optical radiation into distinct input channels;

selecting desired distinct output channels;

propagating said distinct input channels through a selectable grating based switching/routing sub-system, the selectable grating based switching/routing sub-system comprising at least one pixellated switchable component, in order to direct said distinct input channels to desired distinct output channels;

recombining said desired distinct output channels.

2. The method of claim 1 wherein the step of separating input optical radiation comprises the step of utilizing a separating sub-system comprising a pair of separating gratings; and,

wherein the step of recombining said desired distinct output channels comprises the step of utilizing a recombining sub-system comprising a pair of recombining gratings.

3. The method of claim 1 wherein the step of separating input optical radiation comprises the step of utilizing a separating sub-system comprising at least one Array Waveguide Grating (AWG); and,

wherein the step of recombining said desired distinct output channels comprises the step of utilizing a recombining sub-system comprising at least one Array Waveguide Grating.

4. The method of claim 1 wherein the grating based switching/routing sub-system comprises a volume holographic grating based switching/routing sub-system.

5. An optical switching/routing system comprising:  
an optical separating sub-system;  
said optical separating sub-system being capable of separating input optical radiation from at least one input beam/port into distinct input channels;  
an optical recombining sub-system;

a selectable free space grating based switching/routing sub-system, said selectable switching and routing sub-system being interposed optically between said optical separating sub-system and said optical recombining sub-system; said selectable switching and routing sub-system comprising at least one pixellated switchable component; and;

said selectable switching/routing sub-system being capable of switching/routing said distinct input channels to desired distinct output channels;

said optical recombining subsystem being capable of redirecting and recombining said desired distinct output channels for output into at least one output beam/port.

6. (Canceled)

7. The optical system of claim 5 wherein said optical separating sub-system comprises a first separating diffraction grating, and a second separating diffraction grating; and, wherein said optical recombining sub-system comprises a first recombining diffraction grating, and a second recombining diffraction grating.

8. The optical system of claim 7 wherein at least one of said first separating diffraction grating, said second separating diffraction grating, said first recombining diffraction grating, and said second recombining diffraction grating comprises a fixed grating.

9. The optical system of claim 7 wherein at least one of said first separating diffraction grating, said second separating diffraction grating, said first recombining diffraction grating, and said second recombining diffraction grating comprises a volume holographic grating.

10. The optical system of claim 7 wherein said first separating diffraction grating is substantially parallel to said second separating diffraction grating, and, said first recombining diffraction grating is substantially parallel to said second recombining diffraction grating.

11. The optical system of claim 5 wherein said selectable switching/routing sub-system comprises a switchable grating based sub-system.

12. The optical system of claim 9 wherein said switchable grating based sub-system comprises a planar switchable grating based sub-system.

13. The optical system of claim 5 wherein said selectable switching and routing sub-system comprises a switchable mirror based sub-system.



14. The optical system of claim 11 wherein said selectable switching and routing sub-system comprises a planar switchable mirror based sub-system.

15. The optical system of claim 5 wherein said optical separating sub-system comprises an Array Waveguide Grating (AWG); and, wherein the optical recombining sub-system comprises an Array Waveguide Grating.

16. The optical system of claim 13 further comprising at least one microlens array.

17. The optical system of claim 13 further comprising anamorphic optics for circularizing the waveguide outputs of the separating AWG.

18. (Canceled)

19. An optical switching/routing sub-system comprising:

first diffractive grating means for receiving and directing each of a plurality of input beams of electromagnetic radiation to travel in free space along a predetermined path of a plurality of separate paths to a predetermined output location of a plurality of output locations; and

second diffractive grating means;

said first diffractive grating means comprising a plurality of substantially evenly spaced apart switchable transmissive diffractive gratings and each of said spaced apart switchable transmissive diffractive gratings having at least one separately switchable region; and

said at least one said separately switchable region of said switchable diffractive gratings capable of being selectively activated or deactivated in order to independently control which said predetermined path of said plurality of separate paths at least one of said plurality of input beams of electromagnetic radiation travels in free space;

said second diffractive grating means receiving a plurality of output beams from said plurality of output locations and redirecting said output beams, said plurality of redirected output beams being substantially parallel and substantially coplanar to said plurality of input beams;

said first diffractive grating means and said second diffractive grating means constituting a planar switch.

20. The optical switching and routing sub-system of claim 19 wherein said second diffractive grating means comprises a fixed grating.

21. The optical switching and routing sub-system of claim 19 further comprising a reflector array;

a location of said second diffractive grating means being substantially coincident with extensions of substantially evenly spaced apart switchable transmissive diffractive gratings; and

wherein said reflector array further redirects said plurality of output beams ensuring that said plurality of output beams remain separated.

Serial No. 10/700,828  
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Atty Dkt. 10020907-1

**(9) EVIDENCE APPENDIX**

No evidence pursuant to §§ 1.130, 1.131 or 1.132 or entered by or relied upon by the Examiner is being submitted.

**(10) RELATED PROCEEDINGS AND INTERFERENCES**

**APPENDIX**

No related proceedings are referenced in (2) above. Accordingly, no copies of decisions in related proceedings are provided.